Installation, Start-Up, and Operating Instructions

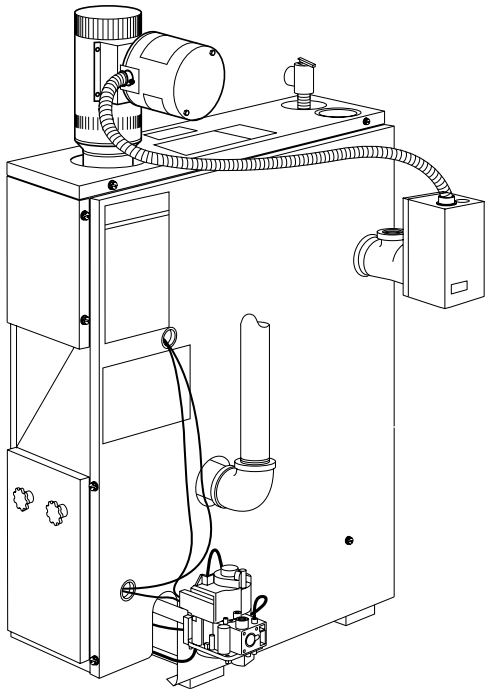
Gas-Fired
Natural Draft Hot Water Boilers
Sizes 37,500 through 280,000
Series B

BW1
BW2

ASME

NOTE: Read the entire instruction manual before starting the installation. These instructions must be affixed on or adjacent to the boiler.
This symbol → indicates a change since the last issue.

→ **MODEL BW1**
Continuous Pilot



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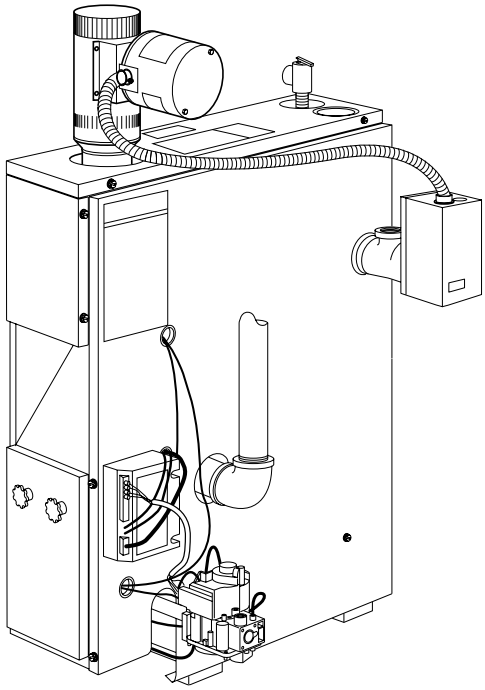
MODEL BW2
Electronic Intermittent Ignition



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SAFETY CONSIDERATIONS

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment. Untrained personnel can perform basic maintenance functions such as maintaining water level. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in literature, on tags, and on labels attached to or shipped with unit and other safety precautions that may apply.

→ Follow all safety codes. In the United States, follow all safety codes including the National Fuel Gas Code (NFGC) NFPA 54-2002/ANSI Z223.1-2002. In Canada, refer to the CAN/CGA-B149.1- and .2-M00 National Standard of Canada, Natural Gas and Propane Installation Codes (NSCNGPIC). Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

Recognize safety information. This is the safety-alert symbol ⚠ . When you see this symbol on unit or in instructions and manuals, be alert to potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with safety-alert symbol. DANGER identifies most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

INTRODUCTION

→ These Gas-Fired Water Boilers are low-pressure, sectional cast iron boilers design certified by CSA International (A.G.A. and C.G.A.) for use with natural and propane gases. They are constructed and hydrostatically tested for a maximum working pressure of 50 psi in accordance with the American Society of Mechanical Engineers (A.S.M.E.) Boiler and Pressure Vessel Code Section IV Standards for cast iron heating boilers.

Check to be sure boiler size is correct before starting installation. See rating and capacity table shown in Fig. 1. Also be sure new boiler is for the type of gas being used. Check rating plate on right side of boiler.

The boiler must be supplied with correct type of gas, fresh air for combustion, and a suitable electrical supply. Boiler must also be connected to a suitable venting system and an adequate piping system. Finally, a properly located thermostat is needed for control of heating system. If there are any doubts as to the various requirements, check with local authorities and obtain professional help where needed. Take time to complete all the steps for SAFE and PROPER operation of heating system.

If this boiler is installed in a building under construction, special care must be taken to insure a clean combustion air supply during the construction process. Airborne particulates such as from drywall dust and from fiberglass insulation can clog the burner ports and cause incomplete combustion and sooting.

Where required by authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

Before installing the boiler in the United States, refer to the current edition of the NFGC and the NFPA 90B. For copies of the NFGC and NFPA 90B, contact the National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269; or for only the NFGC contact the American Gas Association, 400 N. Capitol St., N.W., Washington DC 20001.

Before installing the boiler in Canada, refer to the NSCNGPIC. For a copy of the NSCNGPIC, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3, Canada.

Installation must comply with regulations of serving gas supplier and local building, heating, plumbing or other codes in effect in the area in which installation is made. In absence of local building codes, installation must comply with NFGC in the United States and the NSCNGPIC in Canada.

The following steps are all necessary for proper installation and safe operation of boiler.

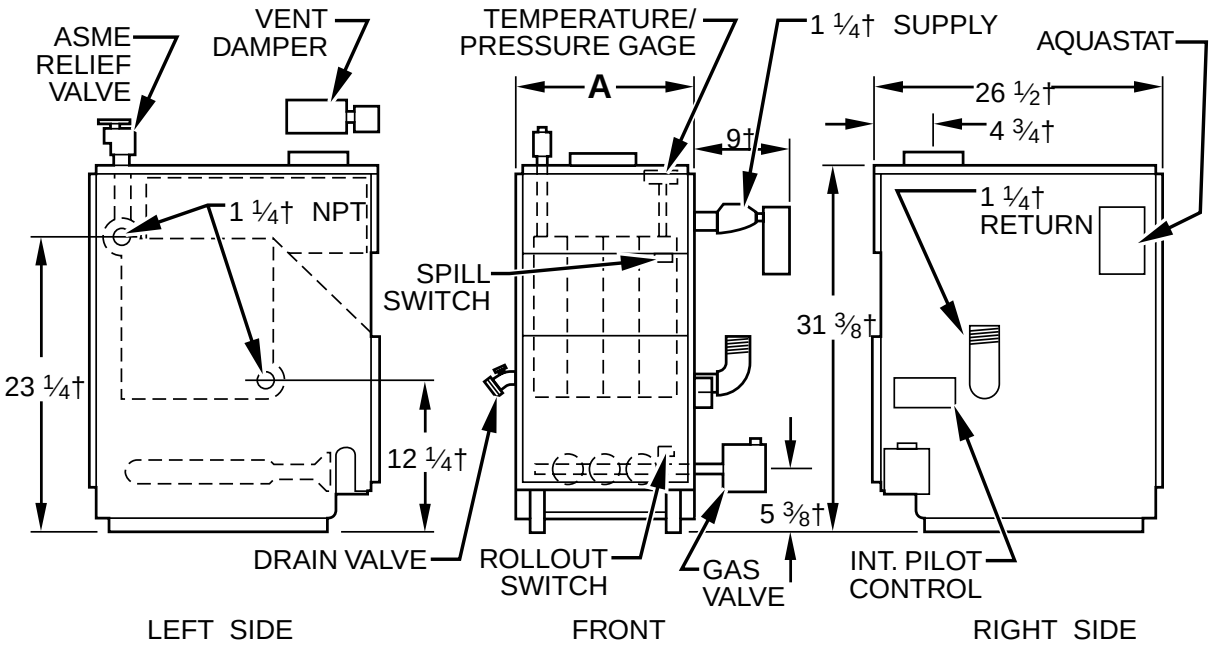
1. LOCATING THE BOILER
2. FRESH AIR FOR COMBUSTION
3. INSTALLATION—SYSTEM PIPING
4. CHIMNEY AND VENT PIPE CONNECTION
5. GAS SUPPLY PIPING
6. ELECTRICAL WIRING
7. CHECKING AND ADJUSTING

→ **⚠ WARNING: To prevent fires or explosions, keep boiler area clean and free from combustible materials, gasoline, and other flammable vapors and liquids. Failure to follow this warning could result in explosion, fire, personal injury, or death.**

⚠ WARNING: Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory-authorized and listed kits or accessories when modifying this product. Boilers with cast iron burners are not to be converted to propane. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.

NOTE: Installers—Follow local regulations with respect to installation of CO detectors. Follow maintenance recommendations in this instruction manual.

BOILER RATINGS AND CAPACITIES



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Gas-Fired Hot Water Boilers

BOILER MODEL NUMBER		NO. OF SECTIONS	NATURAL AND PROPANE GAS*			DIMENSIONS (IN.)	
Electronic Ignition with Vent Damper	Continuous Pilot with Vent Damper		A.G.A. Input MBH	Heating Capacity MBH	Net I=B=R Rating MBH	Flue Diameter	Width A
BW1AAN000037ABAA	**BW2AAN000037ABAA**	2	37.5	30	26	4†	8
BW1AAN000070ABAA	**BW2AAN000070ABAA**	3	70	57	50	5	11-1/4
BW1AAN000105ABAA	**BW2AAN000105ABAA**	4	105	85	74	6	14-1/2
BW1AAN000140ABAA	**BW2AAN000140ABAA**	5	140	113	98	6	17-3/4
BW1AAN000175ABAA	**BW2AAN000175ABAA**	6	175	142	123	7	21
BW1AAN000210ABAA	**BW2AAN000210ABAA**	7	210	170	148	7	24-1/4
BW1AAN000245ABAA	**BW2AAN000245ABAA**	8	245	198	172	7	27-1/2
BW1AAN000280ABAA	**BW2AAN000280ABAA**	9	280	226	197	7	30-3/4

* Boilers are equipped for altitudes up to 2000 ft only.
U.S.A Only—For altitudes above 2000 ft, ratings should be reduced at the rate of 4 percent for each 1000 ft above sea level.
Canada Only—Boilers may be used at high altitude by using a certified field conversion kit, resulting in a 10 percent derate.
Heating Capacity is based on Department of Energy (DOE) test procedure.

† The 2-section boilers are equipped with a 3-in. diameter flue collar on draft diverter and use a factory-supplied 3-in. X 4-in. increaser fitting to install factory-supplied 4-in. vent damper.

MBH—1000 Btuh (British Thermal Unit Per Hr) **NOTE:** Add 5-1/2 in. to height for vent damper.

→Fig. 1—Dimensional Drawing and Boiler Ratings and Capacities

The ratings marked "Net I=B=R Rating" indicate the amount of equivalent direct radiation each boiler will take care of under normal conditions and thermostatic control. The Net I=B=R Ratings shown are based on an allowance of 1.15 in accordance with the factors in the I=B=R Standard as published by The Hydronics Institute. New York City MEA Number 39-86E.

Selection of boiler size should be based upon "Net I=B=R Rating" being equal to or greater than calculated heat loss of building.

Consult manufacturer before selecting a boiler for installations having unusual piping and pickup requirements.

These boilers must stand on a noncombustible floor. If installed on a combustible floor, a factory-approved combustible floor base must be used.

BOILERS FOR USE AT HIGH ALTITUDE

This boiler is factory equipped for use at altitudes of 0-2000 ft above sea level. For use at altitudes above 2000 ft above sea level, input ratings are reduced by a change in main burner orifice size.

U.S.A. Only—For altitudes above 2000 ft above sea level, input ratings should be reduced at the rate of 4 percent for each 1000 ft above sea level. Consult the NFGC NFPA54/ANSI Z223.1-2002 or the manufacturer for correct orifice sizing information. High-altitude orifices are available from boiler manufacturer.

Canada Only—For altitudes in the range of 2000-4500 ft above sea level, boilers may be field equipped for use at high altitude by using a certified field conversion kit. The change in main burner orifice size results in boiler's input rating being reduced by 10 percent. The conversion shall be carried out by a manufacturer's authorized representative in accordance with the requirements of manufacturer, provincial or territorial authorities having jurisdiction, and in accordance with the requirements of the CAN/CGA-B149.1 and CAN/CGA-B149.2 Installation Codes. The certified field conversion kit includes a conversion data plate which must be attached to boiler adjacent to rating plate indicating that boiler has been converted for high-altitude use. The conversion data plate must be filled in with the correct conversion information.

LOCATING THE BOILER

NOTE: This unit MUST be set on a concrete or other non-combustible material base or floor.

1. Select level location as centralized with piping system and as near chimney as possible.
2. Place crated boiler at selected location. Remove crate by pulling crate sides from top and bottom boards. When boiler is to be installed on a combustible floor, a combustible floor base must be used.

   This boiler must NOT be installed on carpeting.
3. Boiler is to be level. Metal shims may be used under base legs for final leveling.
4. The floor supporting boiler must be non-combustible. If it is combustible, place the boiler on a factory-approved combustible floor base. We use a 2-in. Cladlite™ pad as a combustible floor base. These are available from your local supplier. Use a minimum 24-in. X 30-in. pad for 2-5 section boilers and a minimum 30-in. X 30-in. pad for 6-7 section boilers. The boiler must be centered on combustible floor base.
5. Additional clearances for service may exceed clearances for fire protection. Always comply with the minimum fire protection clearances shown on the unit. An 18-inch clearance should be maintained on any side where passage is required to access another side for cleaning, servicing, inspecting or replacement of any part that may need attention. An 18-inch clearance is recommended on the control side for servicing.
6. Determine boiler room size. Rooms that are large in comparison with the size of boiler are defined as rooms having a volume equal to or greater than 16 times the volume of the boiler. Where room ceiling height is greater than 8 ft, volume of room shall be figured on the basis of 8 ft ceiling height. Determination of room size should be based on total volume of all gas fired equipment installed in that room. (See Table 1.) Refer to Section 6.3 of NFGC, Central Heating Boilers and Furnaces for further information, including approved methods for reducing clearances in large rooms.
7. Table 2 shows minimum clearances from combustible materials.

Table 1—Room Large In Comparsion With Boiler

BOILER SIZE (SECTIONS)	BOILER VOLUME (CU FT)	MINIMUM ROOM VOLUME REQUIRED TO BE LARGE ROOM (CU FT)*
2	3.8	61.6
3	5.4	86.6
4	7.0	111.6
5	8.5	136.6
6	10.1	161.7
7	11.7	186.7
8	13.2	211.7
9	14.8	236.7

* For room with single boiler only.

Table 2—Minimum Clearances From Combustible Materials and For Servicing

PART OF BOILER	ALCOVE OR ROOM NOT LARGE IN COMPARISON WITH BOILER (IN.)		ROOM LARGE IN COMPARISON WITH BOILER (IN.)
	2—5 Sections	6—9 Sections	2—9 Sections
Top	6	6	6
Rear	6	6	6
Control Side	8	24	6
Opposite Control Side	6	24	6
Front	18	18	18
Flue/Vent Connector	6	6	6
Boiler Piping	1	1	1

8. Equipment shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting, and maintenance of ambient temperature at safe limits under normal conditions of use. Equipment shall be located so as not to interfere with proper circulation of air. When normal infiltration does not provide necessary air, outside air shall be introduced as described in Fresh Air for Combustion section.
9. Advise owner to keep air passages free of obstructions. Ventilation and combustion air must enter boiler room without restrictions.
10. The boiler shall be installed such that the automatic gas ignition system components are protected from water (dripping, spraying, rain , etc.) during appliance operation and service (condensate trap, control replacement, etc.).

FRESH AIR FOR COMBUSTION

Provision for combustion and ventilation air must be in accordance with Section 5.3 of NFGC, Air for Combustion and Ventilation, of the or applicable provisions of local building codes.

Canadian installations must be installed in accordance with NSCNGPIC and all authorities having jurisdiction.

⚠ WARNING: Be sure to provide enough fresh air for combustion. Enough air ensures proper combustion and ASSURES THAT NO HAZARD WILL DEVELOP DUE TO LACK OF OXYGEN. Failure to follow this warning can cause a fire, personal injury, or death.

You must provide for enough fresh air to assure proper combustion. The fire in the boiler uses oxygen. It must have a continuous supply. The air in a house contains only enough oxygen to supply the burner for a short time. Outside air must enter house to replace oxygen used by burner. Study the following examples to determine your fresh air requirements.

⚠ CAUTION: Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products. Excessive exposure to contaminated combustion air will result in safety and performances related problems.

→ **⚠ CAUTION: If a fireplace or a kitchen or bathroom exhaust fan is used, an outside air intake should be installed. These devices rob the boiler and water heater of combustion air which may cause a fire, personal injury or death.**

PROCEDURE 1—BOILER LOCATED IN UNCONFINED SPACE

EXAMPLE 1:

An unconfined space is defined as a space whose volume is not less than 50 cubic feet per 1,000 Btu per hour of the total input rating of all appliances installed in that space.

If your boiler is in an open area (unpartitioned basement) in a conventional house, air that leaks through cracks around doors and windows will usually be adequate to provide air for combustion. The doors should not fit tightly. Do not caulk cracks around windows.

Equipment located in buildings of unusually tight construction shall be provided with air for combustion, ventilation, and dilution of flue gases using methods described in example 2B or shall be specially engineered. The authority having jurisdiction must approve specially engineered installations.

PROCEDURE 2—BOILER LOCATED IN CONFINED SPACE

EXAMPLE 2A: ALL AIR FROM INSIDE THE BUILDING

The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that combined volume of all spaces meets criteria for an unconfined space. The total input of all gas utilization equipment installed in combined space shall be considered in making this determination. Each opening shall have a minimum free area of one square inch per 1,000 Btu per hour of the total input rating of all gas utilization equipment in confined space, but not less than 100 square inches. One opening shall be within 12 inches of top and one within 12 inches of bottom of enclosure. The minimum dimension of air openings shall not be less than 3 inches.

EXAMPLE 2B: ALL AIR FROM OUTDOORS

The confined space shall communicate with the outdoors in accordance with examples 1 or 2. The minimum dimension of air openings shall not be less than 3 in. Where ducts are used, they shall be of the same cross-sectional area as free area of openings to which they connect.

1. Two permanent openings, one commencing within 12 inches of top, and one commencing within 12 inches of bottom of enclosure shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.
   a. Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 sq. in. per 4000 Btu per hour of total input rating of all equipment in enclosure. (See Table 3A.)
   b. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 sq. in. per 2000 Btu per hour of total input rating of all equipment in enclosure. (See Table 3B.)
2. One permanent opening commencing within 12 inches of top of enclosure shall be permitted where equipment has clearance of at least 1 inch from sides and back and 6 inches from front of appliance. The opening shall directly communicate with the outdoors or shall commmunicate through a vertical or horizontal duct to the outdoors or spaces (crawl or attic) that freely communicate with the outdoors and shall have a minumm free area of:
   a. 1 sq. inch per 3000 Btu per hour of the total input of all equipment located in enclosure (see Table 3C), and
   b. Not less than the sum of the areas of all vent connectors in confined space.

Table 3A—Fresh Air Duct Capacities for Vertical Ducts (Btuh)*

	100% FREE AREA	75% FREE AREA	25% FREE AREA
Fresh Air Duct Size (In.)	1/4-in. Mesh Screen	Metal Louvers	Wood Louvers
3" X 12"	144,000	108,000	36,000
8" X 8"	256,000	192,000	64,000
8" X 12"	384,000	288,000	96,000
8-1/2" X 16"	512,000	384,000	128,000

* 1 Square Inch per 4,000 Btuh

Table 3B—Fresh Air Duct Capacities for Horizontal Ducts (Btuh)*

	100% FREE AREA	75% FREE AREA	25% FREE AREA
Fresh Air Duct Size (In.)	1/4-in. Mesh Screen	Metal Louvers	Wood Louvers
3" X 12"	72,000	54,000	18,000
8" X 8"	128,000	96,000	32,000
8" X 12"	192,000	144,000	48,000
8-1/2" X 16"	256,000	192,000	64,000

* 1 Square Inch per 2,000 Btuh

Table 3C—Fresh Air Duct Capacities for Vertical or Horizontal Ducts (Btuh)*

	100% FREE AREA	75% FREE AREA	25% FREE AREA
Fresh Air Duct Size (In.)	1/4-in. Mesh Screen	Metal Louvers	Wood Louvers
3" X 12"	108,000	81,000	27,000
8" X 8"	192,000	144,000	48,000
8" X 12"	288,000	216,000	72,000
8-1/2" X 16"	384,000	288,000	96,000

* 1 Square Inch per 3,000 Btuh

INSTALLATION—SYSTEM PIPING

→ 1. Place boiler in selected location (as close to chimney as possible). Boiler is shipped assembled. Only the relief valve, circulator pump, and a drain line to carry any water or steam to a drain need to be installed.

2. Install relief valve into 3/4-in. pipe on top of boiler. (See Fig. 2.) Use 3/4-in. pipe and field-supplied elbow to carry water or steam to a nearby drain. Do not connect directly to a drain but leave an air gap. No shutoff of any description shall be placed between safety relief valve and boiler, or on any discharge pipes between such safety valves and the atmosphere. Installation of safety relief valve shall conform to the requirements of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV. The manufacturer is not responsible for any water damage. Install drain valve in lower left side of boiler as marked.

3. Connect supply and return lines to boiler. The connections may require certain additional fittings and parts. (See Fig. 2 and 3.)

4. This boiler is equipped with 1-1/4 in. supply and return connections on both the left and right sides of boiler.

→ 5. Install factory-supplied circulator pump on supply piping, after expansion tank and before any zone valves. (See Fig. 2.) Route circulator electrical cable between circulator pump and aquastat and connect cable as shown in Fig. 9 or 10.

In connecting cold water supply to water inlet valve, make sure that a clean water supply is available. When water supply is from a well or pump, a sand strainer should be installed at pump.

A hot water boiler installed above radiation level must be equipped with a low water cut-off device. A periodic inspection is necessary as is flushing of float-type devices per the manufacturer's specific instructions.

PROCEDURE 1—FOR USE WITH COOLING UNITS

1. This boiler, when used in connection with chilled water systems, must be installed so that chilled water is piped in parallel with the heating boiler. Appropriate valves must be used to prevent chilled water from entering the heating boiler. (See Fig. 3.)

2. When this boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, piping system shall be equipped with flow control valves or other automatic means to prevent gravity circulation of boiler water during cooling cycles.

PROCEDURE 2—LOW DESIGN WATER TEMPERATURE SYSTEMS (BELOW 140°F)

If boiler is to be used in a heating system where design water temperatures below 140°F are desired (for example radiant floor heating), a 3-way or 4-way mixing valve or suitable alternative is required to prevent low temperature return water from entering boiler. Follow mixing valve manufacturer's Installation Instructions.

The minimum design return water temperature to boiler to prevent condensation in boiler and venting system is 120°F. The minimum high limit setting is 140°F.

CHIMNEY AND VENT PIPE CONNECTION

For boilers connected to gas vents or chimneys, vent installations shall be in accordance with Part 7 NFGC, Venting of Equipment, in the United States or Part 7 NFGC, Venting System and Air Supply for Appliances, in Canada, and applicable provisions of local building codes.

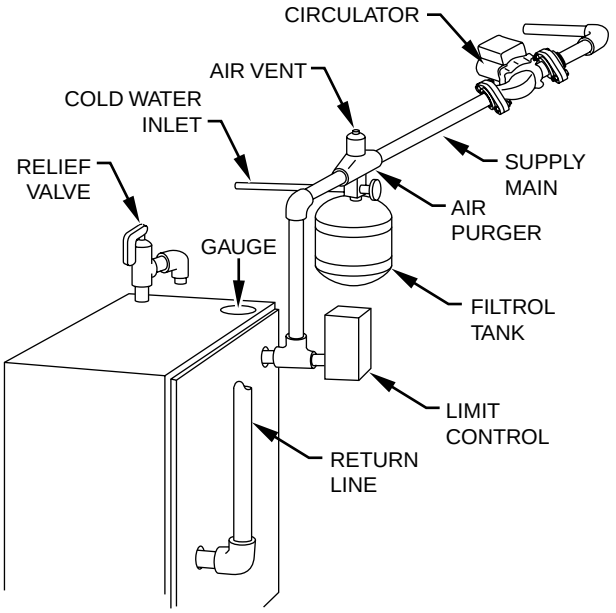

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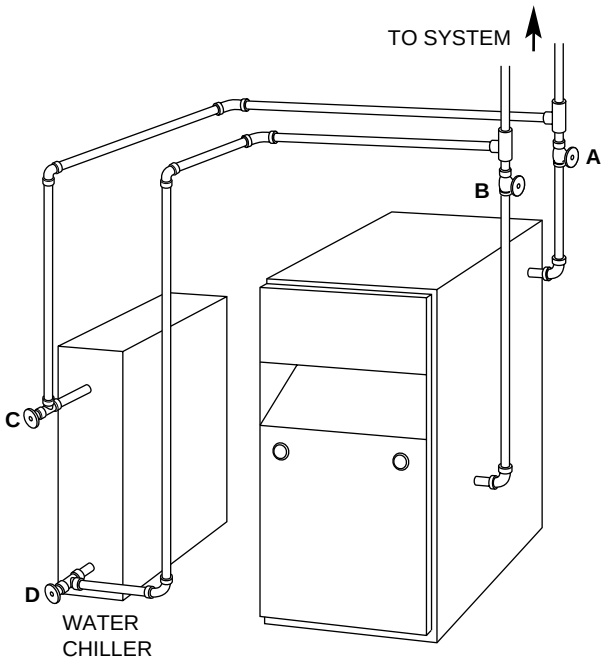
Fig. 2—Typical Hot Water Piping



VALVES C & D
CLOSE FOR HEATING;
OPEN FOR COOLING

VALVES A & B
OPEN FOR HEATING;
CLOSE FOR COOLING

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Fig. 3—Chilled Water Piping

→

PROCEDURE 1—CHECKING CHIMNEY

The chimney is a very important part of heating system. It must be clean, the right size, properly constructed, and in GOOD CONDITION. No boiler can function properly with a bad chimney. Table 4 gives typical chimney sizes. Fig. 4 shows how a boiler might be vented to a chimney. Note that height (HT) is measured from vent pipe to top.

PROCEDURE 2—CHIMNEY SIZING

Chimney sizing and all other aspects of vent installation must be in accordance with Part 7 NFGC Venting of Equipment and applicable provisions of local building codes.

In Canada, follow CAN/CGA B149.1 and B149.2 Installation Codes for Gas Burning Appliances and Equipment.

PROCEDURE 3—CONNECTING VENT DAMPER AND VENT CONNECTOR

Refer to Fig. 1 for size and location of vent (flue opening). Use 28 gauge (minimum) galvanized pipe to connect to chimney.

IMPORTANT: The damper blade on factory-supplied vent damper has a 1/2-sq in. hole (approximately 3/4-in. diameter). On boilers equipped with standing pilot, hole MUST be left open. On boilers equipped with intermittent ignition, hole should be plugged using plug supplied with vent damper.

1. Position factory-supplied vent damper on top of flue outlet collar. Fasten damper securely to flue outlet collar with at least two sheet metal screws spaced 180° apart. Make sure damper blade has clearance to operate inside of diverter.

   On 2-section boilers equipped with vent damper, the factory-supplied 4-in. vent damper is equipped with a 3-in. to 4-in. adapter so that the 4-in. vent damper may be installed on boiler's 3-in. flue outlet collar. Fasten all fittings with sheet metal screws.

   As An Option (U.S.A. Only): The damper may be installed in any horizontal or vertical position (closer to the flue outlet collar preferred). Follow diagrams shown in Fig. 5, 7, and 8.
2. Install vent damper to service only the single boiler for which it is intended. The damper position indicator shall be in a visible location following installation. Locate damper so that it is accessible for servicing.
3. The damper must be in open position when appliance main burners are operating.
4. The boiler is equipped with a factory-wired harness that plugs into vent damper.
5. Vent pipe must be same size as flue outlet collar, except 2-section boilers with vent damper as noted above.
6. Slope pipe up from boiler to chimney not less than 1/4 in. per ft.
7. Run pipe as directly as possible with as few elbows as possible.
8. Do not connect to fireplace flue.
9. End of vent pipe must be flush with inside face of chimney flue. Use a sealed-in thimble for chimney connection.
10. Horizontal run should not be longer than 3/4 the chimney height (HT). (See Fig. 4.)

The sections of vent pipe should be fastened with sheet metal screws to make piping rigid. Horizontal portions of vent system must be supported to prevent sagging. Use stovepipe wires every 5 ft to support pipe from above. If vent pipe must go through a crawlspace, double-wall vent pipe should be used. Where vent pipe passes through a combustible wall or partition, use a ventilated metal thimble. The thimble should be 4 in. larger in diameter than vent pipe.

Table 4—Typical Chimney Sizes

BOILER INPUT (BTUH)	FLUE AREA IN INCHES		
	Height (HT)*		
	10-15 ft	15-25 ft	25 ft up
Up to 100,000	6 X 6	6 X 5	5 X 5
Up to 155,000	6 X 7	6 X 6	6 X 5
Up to 230,000	7 X 8	7 X 7	6 X 7
Up to 350,000	9 X 9	8 X 9	8 X 8

* HT = top of thimble to top of flue. (See Fig. 4.)
For boiler input, refer to Fig. 1.
For information only — not meant to imply minimum sizes.

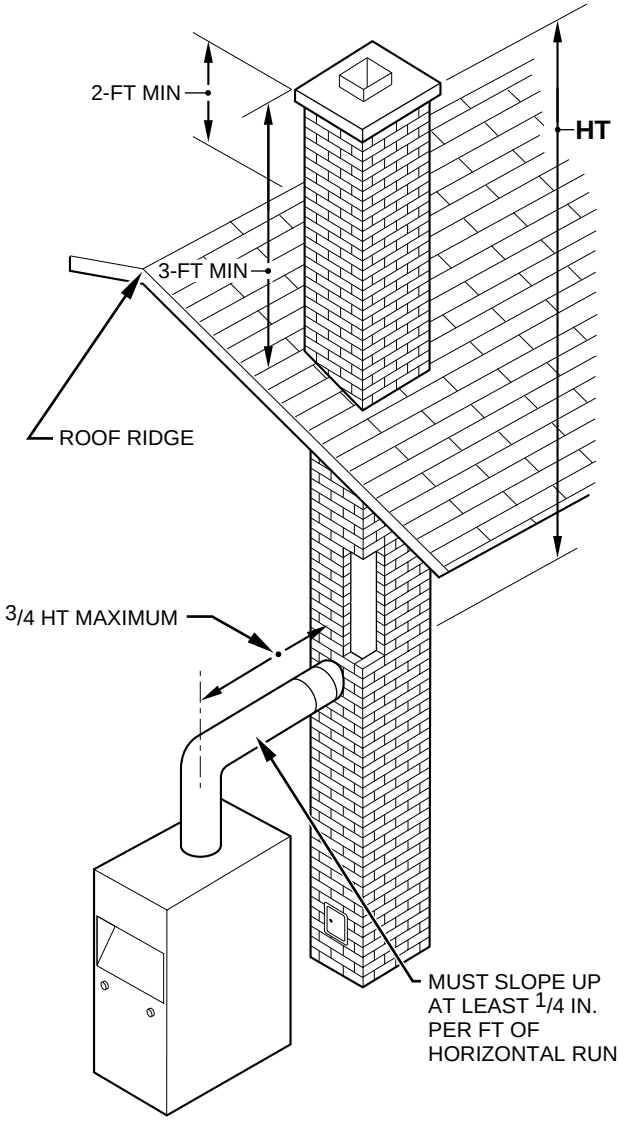


Fig. 4—Typical Masonry Chimney Requirements

PROCEDURE 4—MINIMUM VENT PIPE CLEARANCE

Wood and other combustible materials must not be closer than 6 in. from any surface of single-wall metal vent pipe. Listed Type-B vent pipe or other listed venting systems shall be installed in accordance with their listing.

PROCEDURE 5—REMOVING EXISTING BOILER FROM COMMON VENTING SYSTEM

When an existing boiler is removed from a common venting system, common venting system is likely to be too large for proper venting of appliances remaining connected to it.

At time of removal of an existing boiler, the following items shall be followed with each appliance remaining connected to common venting system placed in operation, while other appliances remaining connected to common venting system are not in operation.

1. Seal any unused openings in common venting system.
2. Visually inspect venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between space in which appliances remaining connected to common venting system are located and other spaces of building. Turn on clothes dryers and any appliances not connected to common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation appliance being inspected. Follow lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at draft hood relief opening after 5 minutes of main burner operation. Use flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.
7. → Any improper operation of common venting system should be corrected so installation conforms with the NFGC ANSI Z223.1-2002. When resizing any portion of common venting system, common venting system should be resized to approach minimum size as determined using the appropriate tables in Part 11 of the NFGC in the United States or Appendix B of the NSCNGPIC in Canada.

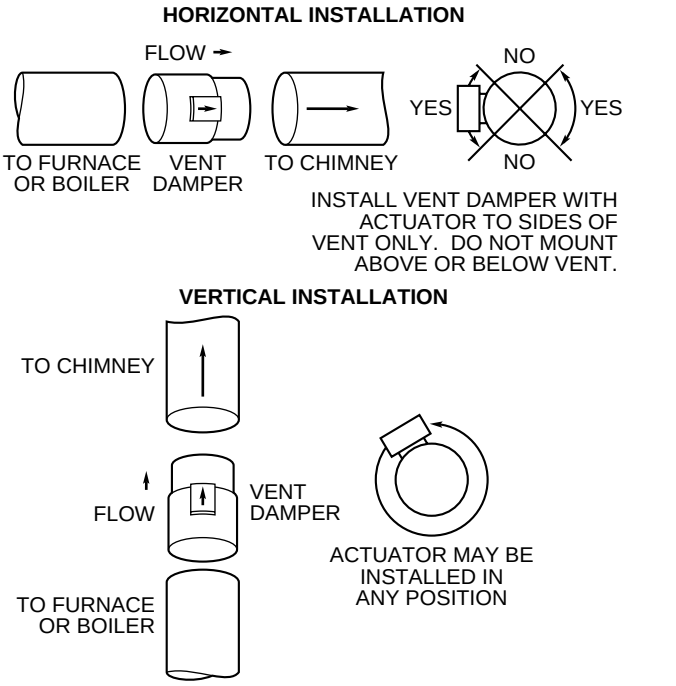


Fig. 5—Horizontal and Vertical Vent Damper Installation

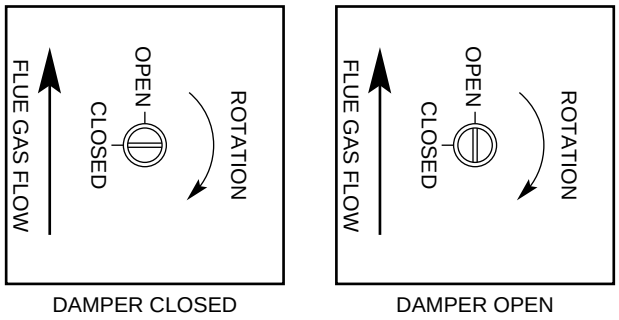
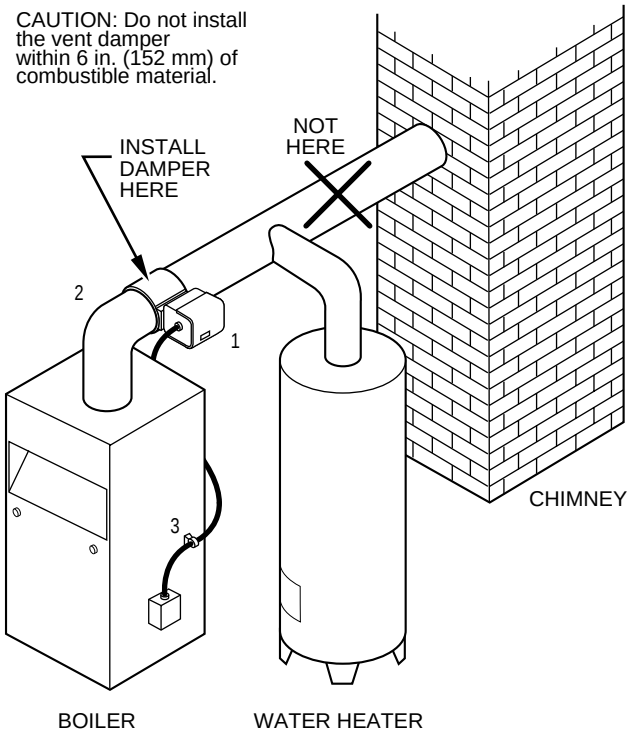


Fig. 6—Vent Damper Position Indicator



1. Install the vent damper to service only the single appliance for which it is intended. If improperly installed, a hazardous condition, such as an explosion or carbon monoxide poisoning, could result.
2. Do not install the vent damper on vent pipe curve.
3. Do not run wires near high temperature surfaces. Use stand-off brackets if necessary.

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Fig. 7—Typical Installation for Vent Damper (Note Caution and Footnotes)

For boilers connected to gas vents or chimneys, vent installations shall be in accordance with Part 7 NFGC, Venting of Equipment, in the United States or Part 7 NFGCPIC, Venting System and Air Supply for Appliances, in Canada, and applicable provisions of local building codes.

Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

VENT DAMPER OPERATION

The vent damper must be inspected at least once a year by a trained, experienced service technician. The name of the person who originally installed vent damper is shown on installation label.

PROCEDURE 1—AUTOMATIC OPERATION OF VENT DAMPER

For safe, efficient operation, vent damper and all flue product carrying areas of appliance must be checked annually with particular attention given to deterioration from corrosion or other sources. If corrosion or other deterioration is observed, contact your heating contractor for repairs. Check vent damper operation as follows:

1. When boiler is off, check that vent damper position indicator points to CLOSED position. (See Fig. 6.)
2. Turn thermostat or controller up to call for heat and check that vent damper indicator points to the OPEN position. (See Fig. 6.)
3. Turn thermostat or controller down again and check that vent damper position indicator returns to CLOSED position.

PROCEDURE 2—MANUAL OPERATION OF VENT DAMPER

The Effikal vent damper may be placed in OPEN position to permit burner operation by using HOLD DAMPER OPEN switch located on damper controller. The thermostat controls burner firing as before while damper remains open. DO NOT turn damper open manually or motor damage will result. Set switch to AUTOMATIC OPERATION to close vent damper during burner off cycle.

For further information and for a vent damper troubleshooting guide, refer to the Effikal manual packaged with vent damper.

PROCEDURE 3—NOTES FOR CANADA ONLY

1. Canadian Standard CAN1-2.28-M81 prohibits the use of vent dampers on propane-fired appliances with intermittent ignition.

2. In Canada, vent damper must be attached directly to flue outlet collar, with the exception of 2-section boiler where the 3-in. to 4-in. adapter is supplied with vent damper. No other interconnecting pieces are allowed between boiler and vent damper.
3. In Canada, vent dampers are not an option. Boilers are either factory built for use with a vent damper and vent damper is supplied with boiler, or they are factory built for use without a vent damper. In the second case, a vent damper cannot be installed later.

GAS SUPPLY PIPING

PROCEDURE 1—CHECKING GAS SUPPLY

The gas pipe to boiler must be the correct size for length of run and total Btuh input of all gas utilization equipment connected to it. See Table 5 for proper size. Be sure gas line complies with local codes and gas company requirements.

The boiler and its individual shutoff valve must be disconnected from gas supply piping system during any pressure testing of gas supply piping system at test pressures in excess of 0.5 psig (3.5 kPa).

The boiler must be isolated from gas supply piping system by closing its individual manual shutoff valve during any pressure testing of gas supply piping system at test pressures equal to or less than 0.5 psig (3.5 kPa).

PROCEDURE 2—CONNECTING GAS PIPING

Refer to Fig. 8 for general layout at boiler. It shows basic fittings needed. The gas line enters boiler from right side.

The following rules apply:

→ 1. Use only those piping materials and joining methods listed as acceptable by the authority having jurisdiction or in the absence of such requirements, by the NFGC ANSI Z223.1-2002. In Canada, follow the CAN/CGA B149.1 and .2 Installation Codes for Gas Burning Appliances and Equipment.
2. Use pipe joint compound suitable for natural and propane gas on male threads only.
3. Use ground joint unions.
4. Install a sediment trap upstream of gas controls.
5. Use 2 pipe wrenches when making connection to gas valve to keep it from turning.
6. Install a manual shutoff valve in vertical pipe about 5 ft above floor.
7. Tighten all joints securely.
8. Propane gas connections should only be made by a licensed propane installer.
9. Two-stage regulation should be used by propane installer.
10. Propane gas piping should be checked by propane installer.

PROCEDURE 3—CHECKING GAS PIPING

Upon completion of piping, check immediately for gas leaks. Open the manual shutoff valve. Test for leaks by applying soap suds (or a liquid detergent) to each joint. Bubbles forming indicate a leak. CORRECT EVEN THE SMALLEST LEAK AT ONCE.

⚠ WARNING: Never use a match or open flame to test for leaks. Use a soap-and-water solution. A failure to follow this warning could result in fire, explosion, personal injury, or death.

ELECTRICAL WIRING

See Fig. 9 and 10 for wiring diagrams for the various models.

Table 5—Gas Pipe Sizes

NATURAL GAS				
Length of Pipe (Ft)	Pipe Capacity—Btuh Input Includes Fittings			
	1/2 in.	3/4 in.	1 in.	1-1/4 in.
20	92,000	190,000	350,000	625,000
40	63,000	130,000	245,000	445,000
60	50,000	105,000	195,000	365,000
PROPANE GAS				
Length of Pipe	Pipe Capacity—Btuh Input Includes Fittings			
(Ft)	Copper Tubing*		Iron Pipe	
	5/8 in.	3/4 in.	1/2 in.	3/4 in.
20	131,000	216,000	189,000	393,000
40	90,000	145,000	129,000	267,000
60	72,000	121,000	103,000	217,000

* Outside diameter.
NOTE: The length of pipe or tubing shown should be measured from gas meter or propane second-stage regulator.

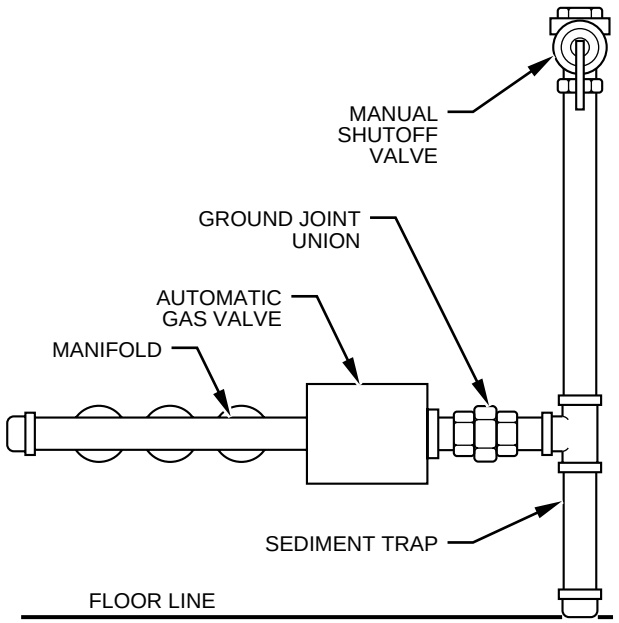

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Fig. 8—Gas Piping at Boiler

→ All electrical work must conform to local codes as well as the National Electrical Code (NEC) ANSI/NFPA-70-2002. In Canada, electrical wiring shall comply with the Canadian Electrical Codes CSA C22.1 and 2.

PROCEDURE 1—ELECTRIC POWER SUPPLY

⚠ WARNING: Turn off electric power at fuse box before making any line voltage connections. Follow local electric codes. Failure to follow this warning could result in electrical shock, personal injury, or death.

Run a separate 120-v circuit from a separate overcurrent protective device in electrical service entrance panel. This should be a 15-amp circuit. Locate a shutoff switch at boiler. It must be turned off during any maintenance. Connect 120-v power supply to aquastat terminals L1 (HOT) and L2.

→ The boiler, when installed, must be electrically grounded in accordance with the requirements of the authority having jurisdiction, or in the absence of such requirements, with the NEC ANSI/NFPA-70-2002. Run a 14 gauge or heavier copper wire from boiler to a grounded connection in service panel or a properly driven and electrically grounded ground rod.

PROCEDURE 2—INSTALLING THERMOSTAT

The thermostat location has an important effect on operation of boiler system. BE SURE TO FOLLOW INSTRUCTIONS INCLUDED WITH THERMOSTAT.

Locate thermostat about 5 ft above floor on an inside wall. It may be mounted directly on wall or on a vertically mounted outlet box. It should be sensing average room temperature so avoid the following:

DEAD SPOTS:

Behind doors
Corners and alcoves

HOT SPOTS:

Concealed pipes
Fireplace
TV sets
Radios
Lamps
Direct sunlight
Kitchens

COLD SPOTS:

Concealed pipes or ducts
Stairwells—drafts
Doors—drafts
Unheated rooms on other side of wall

Set heat anticipator at 0.2 amps. The 24-v thermostat connects to aquastat terminals T and TV.

PROCEDURE 3—VENT DAMPER WIRING

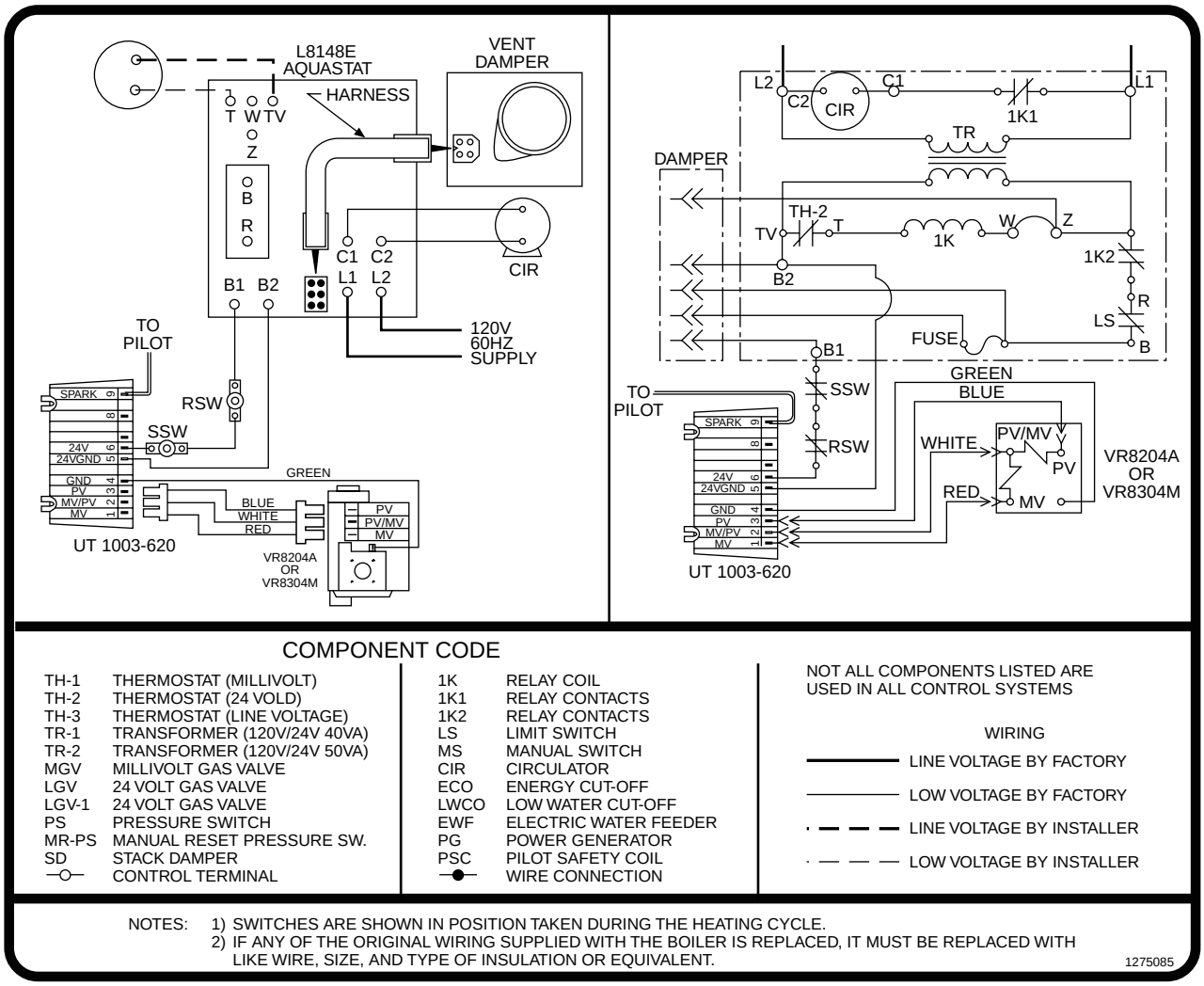
The boiler is equipped with a factory-wired harness with a 4-pin Molex plug which plugs into 4-pin Molex receptacle inside vent damper operator.

The vent damper must be connected for boiler to operate.

⚠ CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

→ PROCEDURE 4—CIRCULATOR PUMP

The pump does not come pre-installed on boiler. It must be connected to circulator harness in the field according to pump manufacturer's instructions and wiring diagrams in this manual.



COMPONENT CODE

TH-1	THERMOSTAT (MILLIVOLT)
TH-2	THERMOSTAT (24 VOLD)
TH-3	THERMOSTAT (LINE VOLTAGE)
TR-1	TRANSFORMER (120V/24V 40VA)
TR-2	TRANSFORMER (120V/24V 50VA)
MGV	MILLIVOLT GAS VALVE
LGV	24 VOLT GAS VALVE
LGV-1	24 VOLT GAS VALVE
PS	PRESSURE SWITCH
MR-PS	MANUAL RESET PRESSURE SW.
SD	STACK DAMPER
—○—	CONTROL TERMINAL

1K	RELAY COIL
1K1	RELAY CONTACTS
1K2	RELAY CONTACTS
LS	LIMIT SWITCH
MS	MANUAL SWITCH
CIR	CIRCULATOR
ECO	ENERGY CUT-OFF
LWCO	LOW WATER CUT-OFF
EWF	ELECTRIC WATER FEEDER
PG	POWER GENERATOR
PSC	PILOT SAFETY COIL
—●—	WIRE CONNECTION

NOT ALL COMPONENTS LISTED ARE USED IN ALL CONTROL SYSTEMS

WIRING

- LINE VOLTAGE BY FACTORY
- LOW VOLTAGE BY FACTORY
- LINE VOLTAGE BY INSTALLER
- LOW VOLTAGE BY INSTALLER

NOTES: 1) SWITCHES ARE SHOWN IN POSITION TAKEN DURING THE HEATING CYCLE.
2) IF ANY OF THE ORIGINAL WIRING SUPPLIED WITH THE BOILER IS REPLACED, IT MUST BE REPLACED WITH LIKE WIRE, SIZE, AND TYPE OF INSULATION OR EQUIVALENT.

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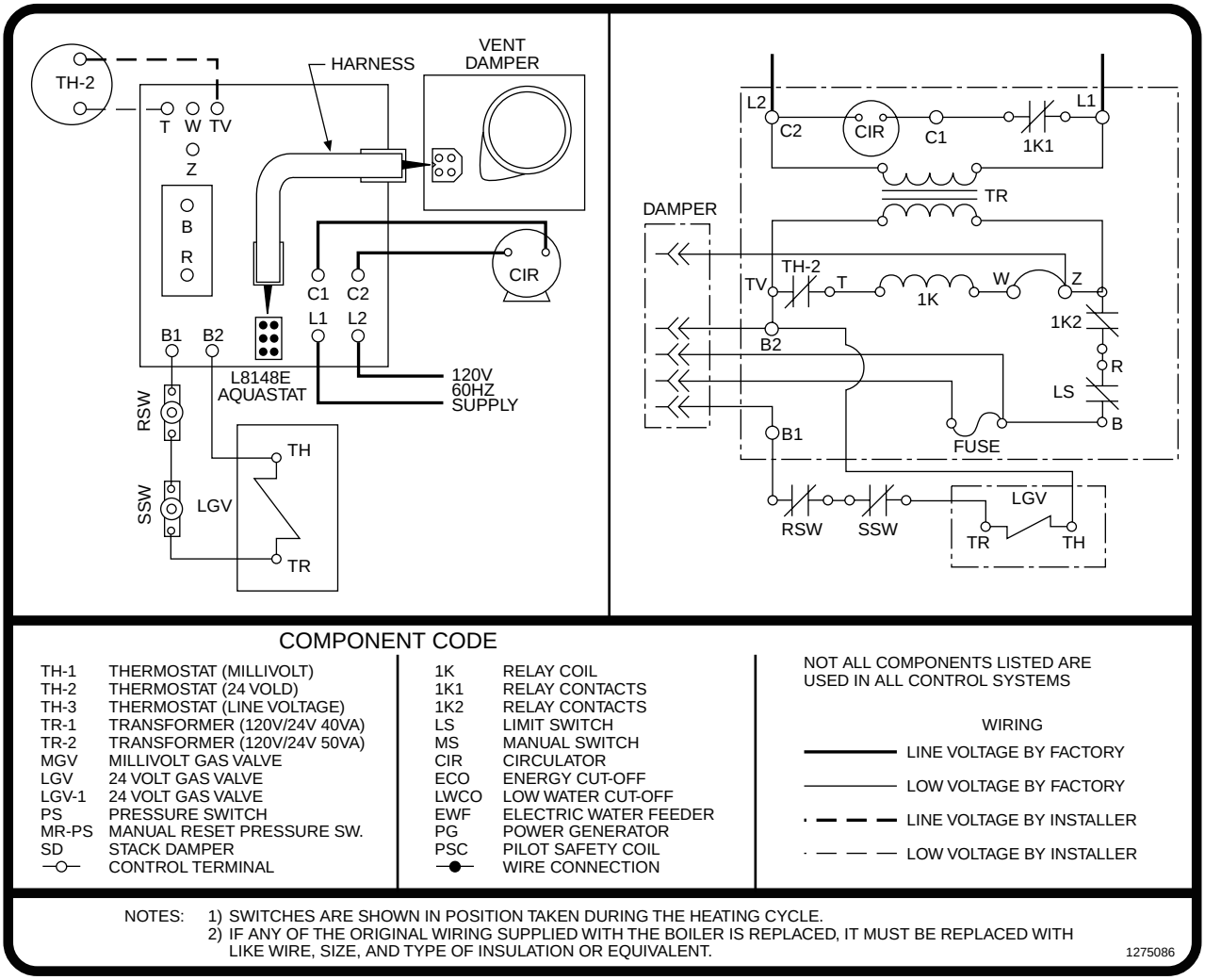
NOTE: If any of the original wire as supplied with this appliance must be replaced, it must be replaced with type 105°C thermoplastic wire or its equivalent.

→ **Fig. 9—Wiring Diagram for Hot Water Boilers with Intermittent Ignition**



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NOTE: If any of the original wire as supplied with this appliance must be replaced, it must be replaced with type 105°C thermoplastic wire or its equivalent.

→ **Fig. 10—Wiring Diagram for Hot Water Boilers with Standing Pilot**

EQUIPMENT AND OPTIONAL ACCESSORIES

PROCEDURE 1—RELIEF VALVE

A relief valve must be installed on boiler. Water expands as it is heated. If there is no place for water to expand into, water pressure builds up inside boiler and system. Should this happen, relief valve automatically opens at a predetermined pressure. This relieves strain on boiler and system. Run a pipe from relief valve outlet (pipe must be same size as outlet, and open end must not be threaded) to an open drain, tub or sink, or other suitable drainage point not subject to freezing. Failure to do so may cause water damage or injury should relief valve release.

PROCEDURE 2—EXPANSION TANK

In a properly assembled system, expanding water flows into expansion tank. This tank should be of the correct size.

The tank is filled with air. As water expands, it compresses air in tank to form an air pressure cushion. This "spring-like" cushion serves to maintain correct operating water pressure regardless of water temperature. This assures a "full measure" of water even in the highest radiation unit of system. It also prevents blowing off the relief valve.

The air in tank in the beginning (with system filled with cold water) is sufficient for proper operation. The tank also serves as a trap for excess air in system. This air would cause gurgling in pipes and inefficient circulation in radiators if left in system.

It is possible for a tank to become "water-logged" (filled with water). It can also become overfilled with air. This can happen after filling system with new water. Fittings are provided on tank and in line to tank for bleeding off excess water or air.

When installing this tank, the following are important:

1. Tank should be higher than boiler top.
2. Pipe to tank should continuously rise up to tank (so that air can "bubble" up to it).

PROCEDURE 3—DIAPHRAGM-TYPE EXPANSION TANK

The diaphragm-type expansion tank (EX-TROL) takes the place of a conventional expansion tank. Read instructions packed with EX-TROL tank assembly carefully.

The EX-TROL tank comes with a 10-12 psi air charge. This is same as the pressure produced in system by automatic fill valve. When system is first filled, EX-TROL tank contains little or no water.

As water is heated, its pressure increases. It expands into EX-TROL tank compressing air in tank. This compressed air cushion permits water in system to expand as temperature changes.

The diaphragm-type tank can be mounted on air purger fitting or at any other convenient place in supply or return line.

PROCEDURE 4—AIR-ELIMINATING FITTING (AIR PURGER)

An air purger is used to remove excess air from system. It is installed in supply line. It eliminates air from water before it reaches radiators and bleeds off this air.

PROCEDURE 5—MAIN AIR VENT FOR DOWNFLOW SYSTEMS OR DIAPHRAGM-TYPE EXPANSION TANK

Before a system is filled with water, there is air in pipes and radiation units. Some of it will be trapped as system fills. It is possible to eliminate most of this air through air vents on radiation units. A main air vent speeds and simplifies this process. It should be installed on highest point in supply main when all radiation is below top of boiler.

PROCEDURE 6—AUTOMATIC FILL VALVE

For safe, efficient operation, a hot water system must be COMPLETELY FILLED with water. Adding new water when needed can be done manually (by use of a hand valve in water supply line). This requires regular attention to system's needs. An automatic fill valve accomplishes this without attention. It is installed in supply line on hot water boilers only. The valve operates through water pressure differentials. It does not require electrical connection.

PROCEDURE 7—DRAIN VALVE

This manual valve provides a means of draining all water from boiler and system. It is often installed in the 3/4-in. tapping at bottom of end boiler section. It can also be installed in a tee where return line enters boiler.

PROCEDURE 8—WATER TEMPERATURE CONTROL

The water temperature limit control in relay is adjustable and may be set as necessary. It may be set as low as 140°F or as high as 240°F. Setting depends on the type and amount of radiation involved and weather conditions.

PROCEDURE 9—CIRCULATING PUMP

→ Every forced hot water system requires a circulating pump. A separate pump or zone valve is required for each zone if there are 2 or more zones. This pump must have capacity to provide circulation required by system. For optimum system performance, pump is connected to supply piping AFTER expansion tank and before any zone valves. Connect pump to aquastat using 5 foot of cable supplied with boiler. The pump may also be connected to return main.

PROCEDURE 10—VENT DAMPER

This is an automatic, motorized stack damper that has been developed to increase efficiency of heating systems by reducing standby losses from heating apparatus and conditioned air space. The damper closes chimney vent when burner is off and fully opens it when combustion is required.

PROCEDURE 11—ROLLOUT SWITCH (FLAME ROLLOUT SAFETY SHUTOFF)

The rollout switch is a temperature-sensitive fuse link device. It is located on boiler base just outside fire box. In the event of heat exchanger flueway blockage causing flame to roll out of fire box, the fuse blows shutting down flow of gas to main burners. The fuse does not change in appearance when blown.

If rollout switch blows, it must be replaced with an exact replacement. Check heat exchanger flueways for blockage when restoring system to operating condition. Do not operate system without a rollout switch.

PROCEDURE 12—SPILL SWITCH (BLOCKED VENT SHUTOFF SYSTEM)

The spill switch is a manual-reset disc thermostat with a fixed set point (340°F) and normally closed contacts. It is located at relief opening of integral draft diverter. In the event of chimney or venting system blockage causing products of combustion to spill out of relief opening, the spill switch disc heats up and spill switch contacts open shutting down flow of gas to main burners by removing power to gas valve.

In the event that the spill switch contacts open, reset button on back of switch pops up. The spill switch must be reset manually after switch has cooled off by pushing reset button down. Check venting system and chimney for blockage when restoring system to operating condition. DO NOT operate system without a spill switch.

STARTING BOILER

PROCEDURE 1—HOW A HOT WATER SYSTEM OPERATES

The entire heating system (boiler, piping, and radiation units) is filled with water. As water in boiler is heated, it is pumped from top of boiler through supply main to radiation units. The cooler water in them flows back through return main to boiler. This provides positive and rapid response to thermostat.

PROCEDURE 2—FILLING SYSTEM WITH WATER

To fill:

1. Close air vents on all radiation units. Open valves to these units.
2. Make sure boiler and expansion tank drain cocks are closed. The air bleed screw on tank drain fitting should be closed.
3. Open valve in line from boiler to expansion tank. Refer to Maintaining Boiler section for additional information.
4. Open water inlet to boiler and leave it open.
5. Start with the LOWEST radiation unit. Open the air vent on this radiation unit. When all air has escaped and water starts to flow from vent, close air vent.
6. Proceed to next lowest radiation unit and repeat process outlined in item 5. Repeat until every radiation unit in system has been covered. End with the highest unit in system.

If units have automatic vents, this manual venting is unnecessary but speeds up proper filling of system.

If system is a closed expansion tank system, there may be an automatic fill valve. It may be left open to refill system automatically as needed. Check temperature-pressure gauge. Note position of hand indicating pressure. This should be between 10 and 15 lb. Any lowering of this movable hand below 10 lb indicates loss of water due to leakage. The automatic fill valve should compensate for this. Instructions are packaged with valve.

→ ⚠ **CAUTION: Never run water into a hot, empty boiler or thermal shock may crack boiler components (sections).**

FOR YOUR SAFETY READ BEFORE OPERATING

⚠ **WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or death.**

A. Some boilers are equipped with an intermittent ignition device which automatically lights the pilot. Do NOT try to light pilot by hand. Some boilers are equipped with a continuous pilot and must be lit manually. See lighting instructions in Continuous Pilot Boiler section. A match holder is included in parts bag.

B. BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to turn gas control knob. Never use tools. If knob will not turn by hand, do not try to repair it. Call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of control system and any gas control which has been under water.

GAS VALVE OPERATING INSTRUCTIONS

PROCEDURE 1—INTERMITTENT IGNITION BOILER—VR8204A/VR8304M GAS VALVE

A. To Turn On Gas To Appliance

1. STOP! Read safety information in "For Your Safety Read Before Operating" section.
2. Set thermostat to lowest setting.
3. Turn off all electrical power to appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do NOT try to light pilot by hand.
5. Remove lower front panel.

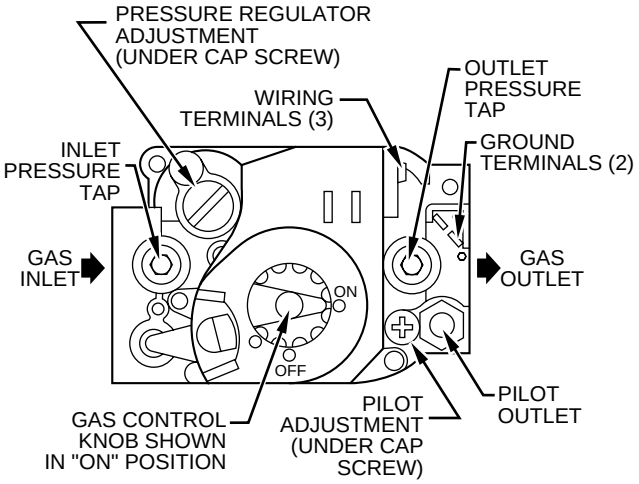

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Fig. 11—VR8204A/VR8304M Intermittent Ignition Gas Valve

6. Turn gas control knob clockwise to OFF position. (See Fig. 11.)
7. Wait 5 minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in safety information in "For Your Safety Read Before Operating" section.
8. Turn gas control knob counterclockwise to ON position. (See Fig. 11.)
9. Replace lower front panel.
10. Turn on all electrical power to appliance.
11. Set thermostat to desired setting.
12. If appliance will not operate, follow instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

B. To Turn Off Gas To Appliance

1. Set thermostat to lowest setting.
2. Turn off all electric power to appliance if service is to be performed.
3. Turn gas control knob clockwise to OFF position. (See Fig. 11.)

PROCEDURE 2—CONTINUOUS PILOT BOILER—VR8200A/VR8300A GAS VALVE

A. To Turn On Gas To Appliance

1. STOP! Read safety information in "For Your Safety Read Before Operating" section.
2. Set thermostat to lowest setting.
3. Turn off all electrical power to appliance.
4. Remove lower front panel.
5. Turn gas control knob clockwise to OFF position. (See Fig. 12.)
6. Wait 5 minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in safety information in For Your Safety Read Before Operating section.
7. Find pilot. Follow metal tube from gas control. The pilot is between 2 burner tubes. (See Fig. 14.)
8. Turn knob on gas control counterclockwise to PILOT position. (See Fig. 12.)
9. Push down and hold red reset button while you light pilot burner with a match. (See Fig. 13.) After about 1 minute, release reset button. Pilot should remain lit. If it goes out, turn gas control knob clockwise to OFF position. To relight, repeat items 5-9.
   - If button does not pop up when released, stop and immediately call your service technician or gas supplier.
   - If pilot will not stay lit after several tries, turn gas control knob to OFF position and call your service technician or gas supplier.
10. After pilot remains lit when red button is released, turn gas control knob counterclockwise to ON position. (See Fig. 12.)
11. Replace lower front panel.
12. Turn on all electrical power to appliance.
13. Set thermostat to desired setting.

B. To Turn Off Gas To Appliance

1. Set thermostat to lowest setting.
2. Turn off all electrical power to appliance if service is to be performed.
3. Turn gas control knob clockwise to OFF position. (See Fig. 12.)

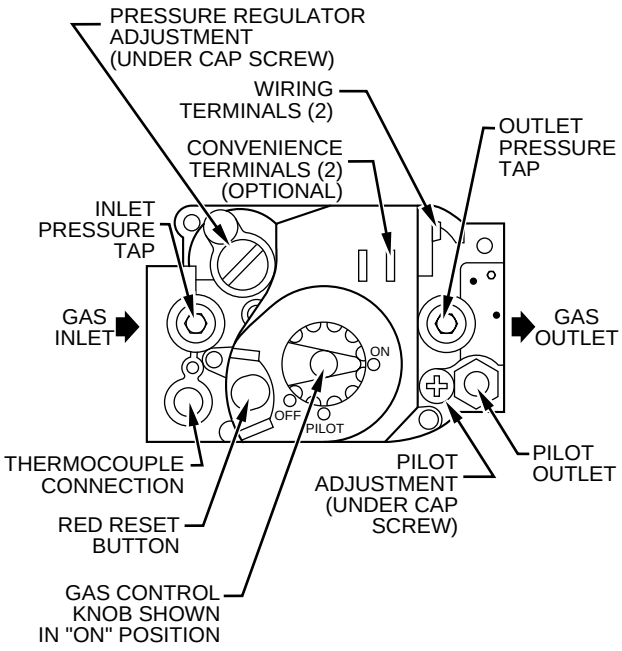

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Fig. 12—VR8200A/VR8300A Continuous Pilot Gas Valve

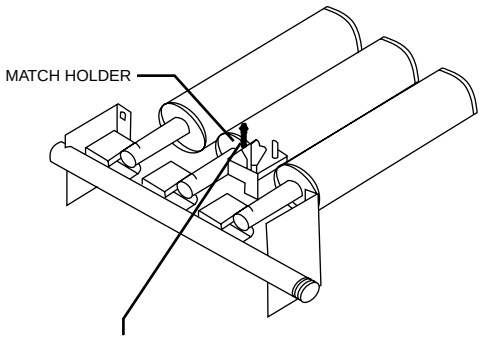

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Fig. 13—Lighting Pilot

OPERATING BOILER

PROCEDURE 1—AUTOMATIC GAS VALVE

The automatic gas valve opens or closes according to heat requirements of thermostat and temperature limit control. It closes if pilot goes out. Each individual control must be operating correctly before any gas can pass to burners. Any 1 control can hold gas supply from burner regardless of demand of any other control.

PROCEDURE 2—SAFETY PILOT

The safety pilot prevents flow of gas to burner if pilot goes out or will not ignite.

PROCEDURE 3—GAS VALVE SAFETY SHUTDOWN TEST

A. Boilers Equipped with Continuous Pilot

With main burners firing, disconnect thermocouple from gas valve. Gas valve should immediately shut off main burners and pilot.

B. Boilers Equipped with Intermittent Ignition

With main burners firing, disconnect ignition cable from intermittent pilot control box. Gas valve should shut off main burners. TURN OFF ELECTRIC POWER to boiler before reconnecting ignition cable to prevent electric shock.

PROCEDURE 4—RELIGHT

The electric and gas shall be off for 5 minutes before relighting.

PROCEDURE 5—THERMOSTAT

Keep thermostat set at desired room temperature. If windows are to be opened or heat is not needed, set thermostat to a lower setting.

NOTE: In the event of failure of any component, system will not operate or will go into safety lockout. The system is completely self-checking. On every call for heat, each component must be functioning properly to permit operation. On safety lockout, system has to be reset by adjusting thermostat to lowest setting for 1 minute, then back to normal setting.

Safe lighting and other performance criteria were met with gas manifold and control assembly provided on boiler when boiler underwent tests specified in ANSI Z21.13-latest revision.

CHECKING AND ADJUSTING

PROCEDURE 1—PILOT BURNER ADJUSTMENT

Pilot flame should surround 3/8 to 1/2 in. of pilot sensor. (See Fig. 14.) If flame needs adjusting, proceed as follows:

1. Remove screw cover over pilot adjusting screw.
2. Insert small screwdriver and adjust flame as needed. Turn screw counterclockwise to increase flame and clockwise to decrease flame.
3. Replace screw cover over pilot adjusting screw.

PROCEDURE 2—MAIN BURNER AIR ADJUSTMENT

The main burners do not require primary air adjustment and are not equipped with primary air shutters. Main burner flames should form sharp blue inner cones in a softer blue outer mantel, with no yellow. Puffs of air from blowing on flame or stamping on floor will cause flames to turn orange momentarily. This is not unusual. Remain still when observing main burner flames. If flame appearance is not correct, check main burner orifices and burner throat and flame ports for dust and lint obstruction. It may be necessary to remove rollout shield to observe main buner flames. Replace rollout shield after observation. (See Fig. 15.)

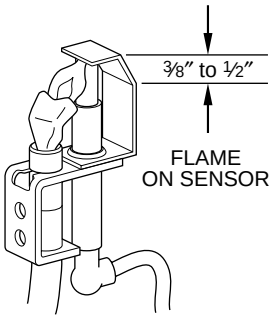

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Fig. 14—Pilot Flame and Sensor

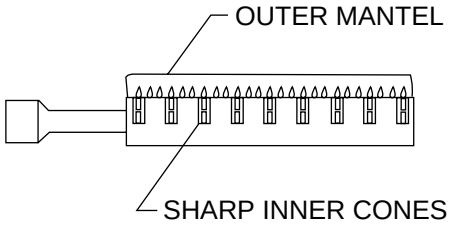

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Fig. 15—Main Burner Flame

PROCEDURE 3—LIMIT CONTROLS ADJUSTMENT

Instructions for each control are included with controls.

Table 6 shows recommended boiler water temperatures. These settings can be changed after becoming familiar with system operation. For example, if system is not giving quite enough heat in very cold weather, the limit setting can be raised to 220°F. Use boiler gage to check settings. Make adjustments according to its readings.

Table 6—Recommended Boiler Water Temperatures

TYPE OF HEATING UNIT	LIMIT CONTROL SETTING
Standing Radiators	180°F
Baseboard and Convector Radiators	200°F

Check thermostat operation. When set above temperature indicated on thermometer, boiler should ignite. Make certain thermostat turns boiler off when room temperature reaches selected setting and starts boiler operating when room temperature falls a few degrees.

After setting limit control to limit setting, check to see if it shuts off gas supply to burners. Set thermostat to call for heat and let boiler run until temperature of water reaches limit setting. Gas valve should shut off, and circulator should keep running until thermostat is satisfied or water cools enough to restart burners through limit control.

Finally, set thermostat for desired temperature. Special conditions in home and location of thermostat govern this setting.

MAINTAINING BOILER

PROCEDURE 1—BURNERS

A visual check of pilot and main burner flames should be made at least once each year, preferably at beginning of heating season. See Checking and Adjusting section.

PROCEDURE 2—RELIEF VALVE

This valve should open automatically when system pressure exceeds pressure rating (usually 30 psi) of relief valve. Should it ever fail to open under this condition, shut down system. Drain system until pressure is reduced below relief valve pressure rating. If valve discharge occurs or if valve fails to open as described above, contact an authorized contractor or qualified service technician to replace relief valve and inspect heating system to determine the cause, as this may indicate an equipment malfunction.

This valve should be tested every month during periods of boiler operation, and at the beginning and end of any extended non-service period. Prior to testing, make certain discharge pipe is properly connected to valve outlet and arranged so as to contain and safely dispose of boiler discharge. Test at normal system operating pressure. Hold trip lever fully open for at least 5 sec in order to flush free any sediment that may lodge on valve seat, then permit valve to snap shut.

PROCEDURE 3—EXPANSION TANK

As previously noted, this tank may become waterlogged or may receive an excess of air. Frequent automatic opening of relief valve indicates waterlogging. A high boiler temperature accompanied by unusually low radiation unit temperature (and "knocking") indicates excess air in tank.

To correct either condition, close valve between boiler and tank. Drain tank until it is empty. Check all tank plugs and fittings. Tighten as necessary. Open valve between boiler and tank. Water will rise to normal height in tank if automatic fill valve is installed, otherwise, manually refill system.

PROCEDURE 4—BOILER FLUE PASSAGES

Under normal operating conditions with burners properly adjusted, it should not be necessary to clean boiler flue gas passages. However, to assure trouble-free operation, we recommend that flue passages, burner adjustment, and operation of controls be checked ONCE EACH YEAR by a competent service technician.

BEFORE THE START OF EACH SEASON (or whenever system has been shut down for some time), recheck whole system for leaks and recheck boiler and vent pipe for leaks. Replace or patch any boiler seals that are faulty.

PROCEDURE 5—VENT PIPE

The venting of this unit is very important. Piping should be checked at least once a season. If vent piping shows any signs of leaking, replace it immediately.

PROCEDURE 6—WATER SYSTEM

If system is to remain out of service during freezing weather, always DRAIN IT completely. Water left in to freeze will crack pipes and/or boiler.

PROCEDURE 7—CLEANING BOILER AND BURNERS

Flue passages between sections should be examined yearly and cleaned if necessary. To clean:

1. Remove burners, pilot, and vent pipe.
2. Remove top and front jacket panels.

3. Remove 2 screws attaching intermediate front panel to left and right side jacket panels.
4. Remove draft diverter and intermediate front panel as 1 unit.
5. Carefully remove cerafelt gasket strips.
6. Clean passageways between sections with a flexible handle wire brush. Remove dirt from bottom of boiler and between sections by vacuuming.
7. Make sure all flame ports in burners are open and clear. Shake out or blow out all loose dirt in burners.
8. Reseal seams between adjacent sections as necessary with 400°F RTV silicone sealant.
9. Reassemble all parts. Be sure to check tightness of pilot connections and condition of burner flames after reassembly. (See Fig. 14 and 15.)
10. Be sure vent pipe connections to chimney are secure and no obstructions are present.

SERVICE HINTS

You may avoid inconvenience and service calls by checking these points before you call for service.

FOR YOUR SAFETY WHAT TO DO IF YOU SMELL GAS

1. **Do not try to light any appliance.**
2. **Do not touch any electric switch; do not use the phone.**
3. **Leave the building immediately, then call your gas supplier.**
4. **If you cannot reach the gas supplier, call the fire department.**

IF SYSTEM IS NOT HEATING OR NOT GIVING ENOUGH HEAT. . .	
Possible Cause	**What To Do**
Thermostat is not set correctly	Reset thermostat above room temperature.
Burner is not operating properly	Check flame. If it is yellow, burner is not getting enough air. If flame is blue and noisy and seems to lift off the burner, burner is getting too much air. Contact your service technician.
No electric power to boiler	Check overcurrent protection. Check to be sure electric power supply circuit is on.
Controls out of adjustment	Reset according to instructions.
Radiators not heating	Open radiator vents to vent excess air. Check flow control valve (if used). It may be in closed position.
Circulator pump not running	Check overcurrent protection. Check relay operation.
Poor electrical contact	Check all control terminals and wire joints.
Rollout switch blown	Have your service technician check heat exchanger for blockage. Replace rollout switch with exact replacement.
Spill switch opened	Have your service technician check venting system and chimney for blockage or down draft condition. Reset spill switch.
Vent damper not operating	Consult troubleshooting guide in Effikal manual, packaged with vent damper.
IF BURNER IS NOISY. . .	
Possible Cause	**What To Do**
Gas input amount is incorrect	Contact your service technician.
RELIEF VALVE LEAKING. . .	
Possible Cause	**What To Do**
Dirt on seat	Open valve manually. Allow water to run and clear valve seat.
Waterlogged expansion tank	Drain tank. See instructions.

HAVE YOUR SERVICE TECHNICIAN CHECK ANY PROBLEM YOU ARE UNABLE TO CORRECT.

REPAIR PARTS

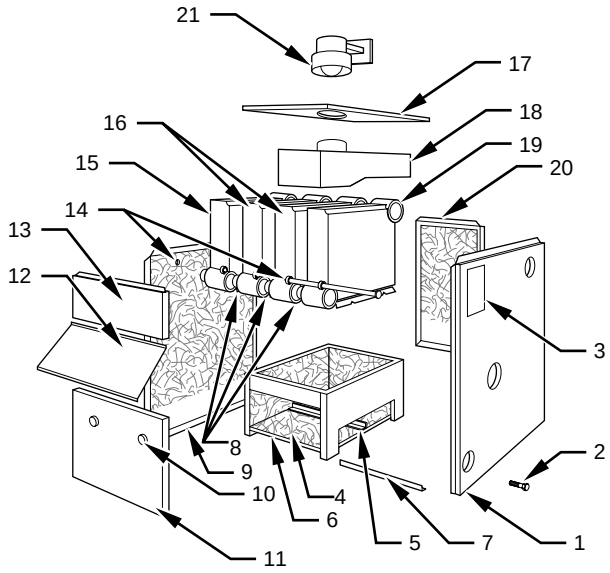
GAS-FIRED HOT WATER BOILERS

—IMPORTANT—
READ THESE INSTRUCTIONS BEFORE ORDERING

All parts listed in the following Parts List may be ordered through your nearest supplier.

When ordering parts, first obtain Model No. from data plate on boiler, then determine Part No. (not Key No.) and Description of each part from the following illustrations and lists. Be sure to give all this information:

Part No. — Part Description — Boiler Model No.



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→ **Jacket—Section and Base Parts**

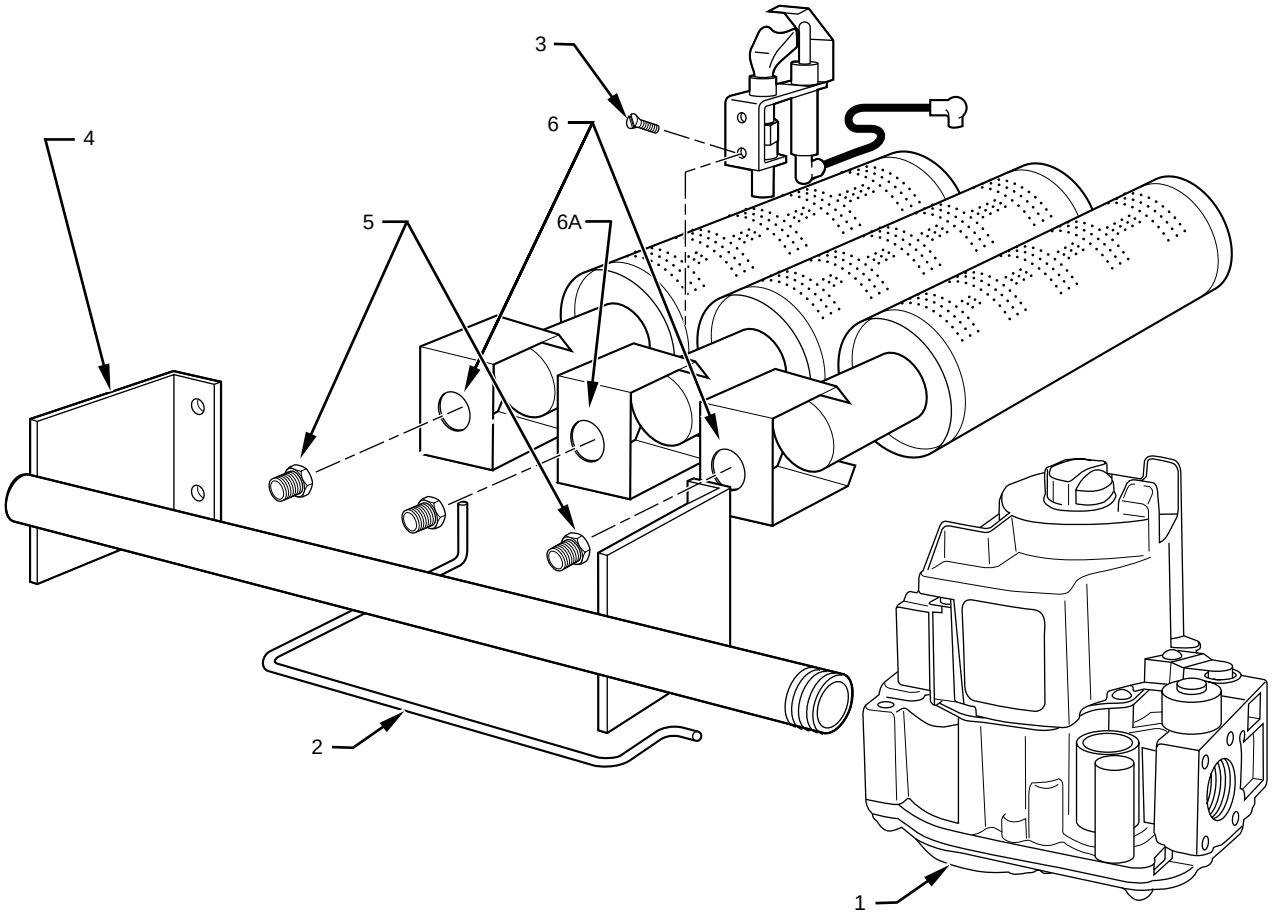
This is a Repair Parts List—Not a Packing List

KEY NO.	DESCRIPTION		PART NO.							
			2 Section	3 Section	4 Section	5 Section	6 Section	7 Section	8 Section	9 Section
1	Jacket, Right Side Panel		425-00-901	425-00-901	425-00-901	425-00-901	425-00-901	425-00-901	425-00-901	425-00-901
2	No. 10 X 1/2-in. Sheet Metal Screw		146-95-074	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074
3	Rating Plate		146-94-016	146-94-016	146-94-016	146-94-016	146-94-016	146-94-016	146-94-016	146-94-016
4	Base Insulation	Base Sides (2)	146-14-020	146-14-130	146-14-130	146-14-130	146-14-130	146-14-130	146-14-130	146-14-130
		Base Front	146-14-112	146-14-113	146-14-114	146-14-115	146-14-116	146-14-117	146-14-118	146-14-119
		Base Rear	146-14-122	146-14-123	146-14-124	146-14-125	146-14-126	146-14-127	146-14-128	146-14-129
5	Base Baffle		425-00-642	425-00-643	425-00-644	425-00-645	425-00-646	425-00-647	425-00-648	425-00-649
6	Base		425-00-662	425-00-663	425-00-664	425-00-665	425-00-666	425-00-667	425-00-668	425-00-669
7	Jacket Tie Bar		425-00-652	425-00-653	425-00-654	425-00-655	425-00-656	425-00-657	425-00-658	425-00-659
8	Push Nipple		433-00-976	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976
9	Jacket, Left Side Panel		425-00-900	425-00-900	425-00-900	425-00-900	425-00-900	425-00-900	425-00-900	425-00-900
10	Knob, Service Door (Pair)		137-02-153	137-02-153	137-02-153	137-02-153	137-02-153	137-02-153	137-02-153	137-02-153
11	Jacket, Service Door		425-00-912	425-00-913	425-00-914	425-00-915	425-00-916	425-00-917	425-00-918	425-00-919
12	Jacket, Intermediate Panel		425-00-812	425-00-813	425-00-814	425-00-815	425-00-816	425-00-817	425-00-818	425-00-819
13	Jacket, Front Panel		425-00-810	425-00-811	425-00-804	425-00-805	425-00-806	425-00-807	425-00-808	425-00-809
14	1/4-in. Tie Rod and Nut		146-05-008	146-05-001	146-05-002	146-05-051	146-05-053	146-05-005	146-05-007	146-05-009
15	Boiler Section, Left End		410-00-020	410-00-020	410-00-020	410-00-020	410-00-020	410-00-020	410-00-020	410-00-020
16	Boiler Section, Middle		410-00-022	410-00-022	410-00-022	410-00-022	410-00-022	410-00-022	410-00-022	410-00-022
17	Jacket, Top Panel		425-00-842	425-00-843	425-00-844	425-00-845	425-00-846	425-00-847	425-00-848	425-00-849
18	Draft Diverter		425-00-672	425-00-673	425-00-674	425-00-675	425-00-676	425-00-677	425-00-678	425-00-679
19	Boiler Section, Right End		410-00-021	410-00-021	410-00-021	410-00-021	410-00-021	410-00-021	410-00-021	410-00-021
20	Jacket, Back Panel		425-00-902	425-00-903	425-00-904	425-00-905	425-00-906	425-00-907	425-00-908	425-00-909
*	Jacket Complete		425-70-992	425-70-993	425-70-994	425-70-995	425-70-996	425-70-997	425-70-998	425-70-990
*	Block Assembly (8, 14, 15, 16, 19)		410-00-213	410-00-313	410-00-413	410-00-513	410-00-613	410-00-713	410-00-813	410-00-913
*	Combustible Floor Plate		146-14-031	146-14-031	146-14-031	146-14-031	146-14-031	146-14-032	146-14-032	146-14-032
*	Cerafelt Gasket		146-14-018	146-14-018	146-14-018	146-14-018	146-14-018	146-14-018	146-14-018	146-14-018
21	Vent Damper		118-20-04	118-20-05	118-20-06	118-20-06	118-20-07	118-20-07	118-20-07	118-20-07
*	Base Assembly (4, 5, 6)		433-00-662	433-00-663	433-00-664	433-00-665	433-00-666	433-00-667	433-00-668	433-00-669

* Not illustrated.

REPAIR PARTS

FOR USE WITH NATURAL GAS ONLY



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Gas Burners and Manifold Parts

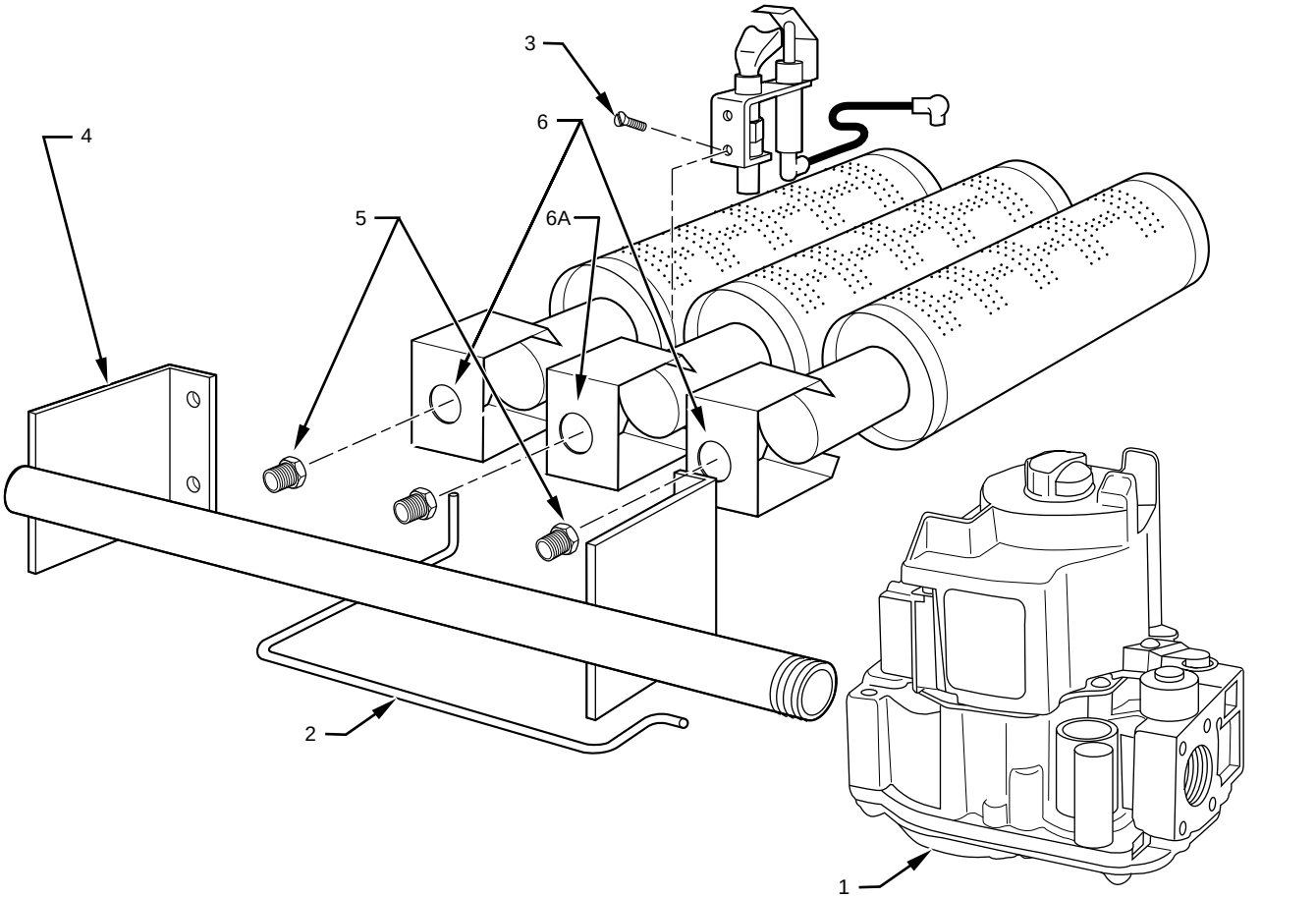
This is a Repair Parts List—Not a Packing List

KEY NO.	DESCRIPTION	PART NO.							
		2 Section	3 Section	4 Section	5 Section	6 Section	7 Section	8 Section	9 Section
ELECTRONIC INTERMITTENT IGNITION (Shown)									
1	24-v Gas Valve, Electronic Intermittent Ignition	146-62-052	146-62-052	146-62-052	146-62-052	146-62-058	146-62-058	146-62-058	146-62-058
2	Pilot Tube	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-006	146-15-006
3	10-32 X 1/2-in. Hex Head Screw	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307
4	Gas Manifold	146-16-032	146-16-033	146-16-034	146-16-035	146-16-013	146-16-014	146-16-015	146-16-016
5	Main Burner Orifice*	146-15-031	146-15-031	146-15-031	146-15-031	146-15-035	146-15-035	146-15-035	146-15-035
6	Main Burner†	—	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532
6A	Main Burner with Pilot Bracket	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531
7	Pilot Burner	146-62-095	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092
‡	Rollout Shield	425-00-932	425-00-933	425-00-934	425-00-935	425-00-936	425-00-937	425-00-938	425-00-939
ALTERNATE PARTS FOR CONTINUOUS PILOT — 24V									
1	24-v Gas Valve, Continuous Pilot	146-62-051	146-62-051	146-62-051	146-62-051	146-62-060	146-62-060	146-62-060	146-62-060
3	10-32 X 1/2-in. Hex Head Screw (2 req'd)	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307	146-95-307
7	Pilot Burner	146-62-053	146-62-053	146-62-053	146-62-053	146-62-053	146-62-053	146-62-053	146-62-053
8	Thermocouple	146-62-037	146-62-037	146-62-039	146-62-039	146-62-039	146-62-039	146-62-036	146-62-036

Quantity is 1 unless otherwise noted.
* Requires 1 less than the number of sections.
† Requires 2 less than the number of sections.
‡ Not illustrated.

REPAIR PARTS

FOR USE WITH LIQUIFIED PETROLEUM GAS ONLY



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Liquified Petroleum Gas Burners and Manifold Parts

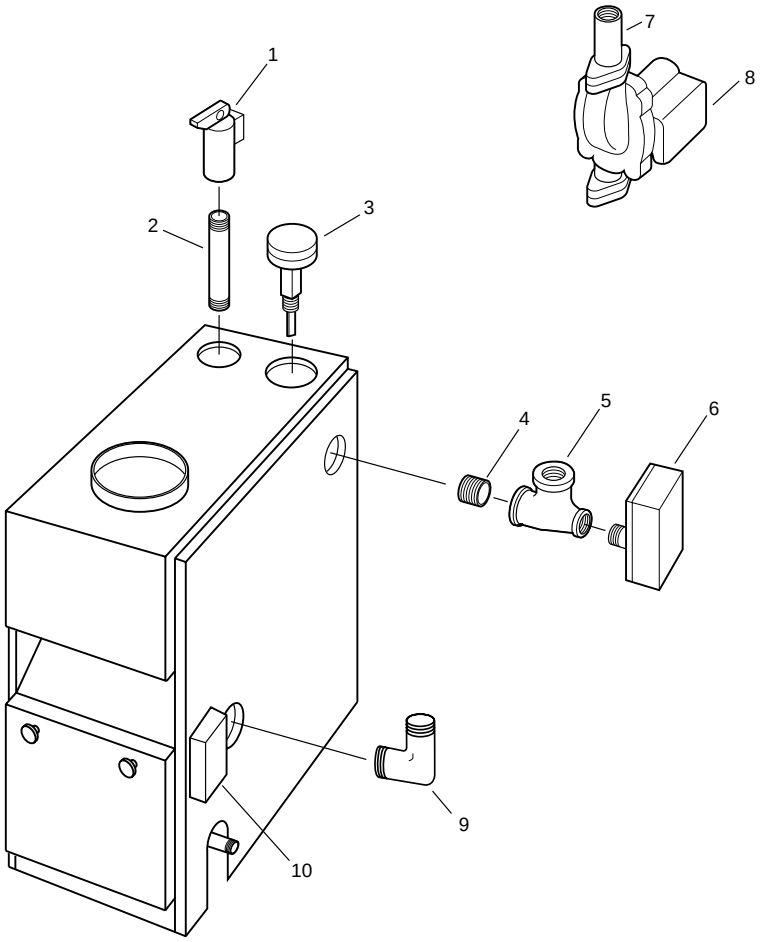
This is a Repair Parts List—Not a Packing List

KEY NO.	DESCRIPTION	PART NO.							
		2 Section	3 Section	4 Section	5 Section	6 Section	7 Section	8 Section	9 Section
ELECTRONIC INTERMITTENT IGNITION (Shown)									
1	24-v Gas Valve, Electronic Intermittent Ignition	146-62-062	146-62-062	146-62-062	146-62-062	146-62-059	146-62-059	146-62-059	146-62-059
2	Pilot Tube	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-005	146-15-006	146-15-006
3	10-32 X 3/16-in Hex Head Screw	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
4	Gas Manifold	146-16-009	146-16-010	146-16-011	146-16-012	146-16-013	146-16-014	146-16-015	146-16-016
5	Main Burner Orifice*	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036	146-15-036
6	Main Burner†	—	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532
6A	Main Burner with Pilot Bracket	146-15-529	146-15-529	146-15-529	146-15-529	146-15-529	146-15-529	146-15-529	146-15-529
7	Pilot Burner	146-62-093	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094
‡	Rollout Shield	425-00-932	425-00-933	425-00-934	425-00-935	425-00-936	425-00-937	425-00-938	425-00-939
ALTERNATE PARTS FOR CONTINUOUS PILOT — 24V									
1	24-v Gas Valve, Continuous Pilot	—	146-62-061	146-62-061	146-62-061	146-62-061	146-62-061	146-62-061	146-62-061
3	10-32 X 3/16-in. Hex Head Screw (2 req'd)	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
7	Pilot Burner	—	146-62-096	146-62-096	146-62-096	146-62-096	146-62-096	146-62-096	146-62-096
8	Thermocouple	—	146-62-037	146-62-039	146-62-039	146-62-039	146-62-039	146-62-036	146-62-036

Quantity is 1 unless otherwise noted.
* Requires 1 less than the number of sections.
† Requires 2 less than the number of sections.
‡ Not illustrated.

REPAIR PARTS

→ BOILER CONTROLS AND PIPING



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KEY NO.	DESCRIPTION	PART NO.
1	3/4-in. ASME Relief Valve	146-22-011
2	3/4-in. X 7-1/2-in. Nipple	146-07-041
3	Temperature Pressure Gage—5-in. Stem	146-23-009
4	1-1/4-in. X 2-1/2-in. Nipple	146-07-044
5	1-1/4-in. X 3/4-in. X 1-1/4-in Tee	146-93-049
6	Aquastat Relay	433-00-522
*	Isolation Valve Set—Taco	146-26-048
*	Isolation Valve Set—Grundfos	146-26-046
7	Cast Iron Flange Set—Taco	146-26-049
*	Cast Iron Flange Set—Grundfos	146-26-050
8	Taco 007 Circulator-Field Installed	CI-001.03
*	Grundfos UP15-42F Circulator- (Optional)**	CI-006.01
9	1-1/4-in. Bent Return Nipple	146-07-003
10	Intermittent Pilot Control	146-62-071
*	Rollout Switch	146-29-002
*	Spill Switch (36TX16-6281) 340°F	146-60-001
*	4-in. Vent Damper (with 3-in. Adaptor)	146-28-011
*	5-in Vent Damper	146-28-001
*	6-in. Vent Damper	146-28-002
*	7-in. Vent Damper	146-28-003
*	400°F Black Silicone Rubber Adhesive Sealant (10.3 oz cartridge)	146-06-020
*	Vent Damper Operator (Motor)	114-00-02

* Not illustrated.
** Available as a service part only